Question	Answer	Marks	Guidance
6	$81+108ax+54a^2x^2+12a^3x^3$ soi or $12a^3=\frac{3}{2}$ $b=108a$ $c=54a^2$ soi	**M3**	**M2** for any 3 correct terms or 2 correct equations or **M1** for any 2 correct terms, 1 correct equation or for correct but insufficiently simplified expansion e.g. $3^4+4\times3^3\times ax+\frac{4\times3}{2}\times3^2\times(ax)^2$ $+\frac{4\times3\times2}{3\times2}\times3\times(ax)^3$
	$a=\frac{1}{2}$ oe	**A1**	
	$b = 54$	**A1**	**FT** 108 × *their a*, providing at least **M1** awarded
	$c=\frac{27}{2}$ oe	**A1**	**FT** 54 × (*their a*)^2, providing at least **M1** awarded
7	${}^nC_4=\frac{n!}{(n-4)!4!}$ and ${}^nC_2=\frac{n!}{(n-2)!2!}$ soi	**B1**	
	$\frac{n(n-1)(n-2)(n-3)}{24}=\frac{13n(n-1)}{2}$ or $(n-2)(n-3)=\frac{13\times24}{2}$ oe, soi	**M1**	Writes in a correct form, free of factorials
	$n^2-5n-150$ $[=0]$	**A1**	
	$n = 15$ only, nfww	**A1**	**dep** on previous A1
	${}^{15}C_8=6435$ only	**B1**	
8(a)	(Velocity vector =) $\frac{26}{\sqrt{12^2+5^2}}\begin{pmatrix}12\\5\end{pmatrix}$ oe	**M2**	**M1** for $\sqrt{12^2+5^2}$ or 13 or 2 seen
	(Position vector =) $\begin{pmatrix}3\\-2\end{pmatrix}+t\begin{pmatrix}24\\10\end{pmatrix}$ oe	**A1**	

Question	Answer	Marks	Guidance
8(b)	(Direction vector =) $\begin{pmatrix}4\\3\end{pmatrix}$ soi or x component: $\cos\alpha = \frac{4}{5}$ y component: $\sin\alpha = \frac{3}{5}$ soi	**B1**	
	(Velocity vector =) $\frac{20}{\sqrt{4^2+3^2}} \times their \begin{pmatrix}4\\3\end{pmatrix}$ oe soi or $20\begin{pmatrix}their\cos\alpha\\their\sin\alpha\end{pmatrix}$ soi	**M1**	
	(Position vector =) $\begin{pmatrix}67\\-18\end{pmatrix} + t\begin{pmatrix}16\\12\end{pmatrix}$ oe	**A2**	**A1 FT** $\begin{pmatrix}67\\-18\end{pmatrix} + t \times their \begin{pmatrix}16\\12\end{pmatrix}$ If zero scored, **SC2** for one correct component, either $67+16t$ or $-18+12t$
8(c)	$3+24t = 67+16t$ oe or $-2+10t = -18+12t$ oe	**M1**	**FT** Equates *their x* components, or *their y* components from parts **(a)** and **(b)**, providing of equivalent difficulty, e.g. $a+bt = c+dt$
	$t = 8$	**A1**	**dep** on full marks in **(a)** and **(b)**
	(Position of meeting =) $\begin{pmatrix}195\\78\end{pmatrix}$	**A1**	**dep** on full marks in **(a)** and **(b)**
9(a)	$\frac{\mathrm{d}}{\mathrm{d}x}\left(\mathrm{e}^{-2x}\right) = -2\mathrm{e}^{-2x}$ soi	**B1**	
	$\frac{\mathrm{d}y}{\mathrm{d}x} = k\mathrm{e}^{-2x} - 2kx\mathrm{e}^{-2x}$ oe, isw	**B1**	**FT** for use of product rule $k.\mathrm{e}^{-2x} + kx.\left(their \frac{\mathrm{d}}{\mathrm{d}x}\left(\mathrm{e}^{-2x}\right)\right)$
	Alternative		
	$\frac{\mathrm{d}}{\mathrm{d}x}\left(\mathrm{e}^{2x}\right) = 2\mathrm{e}^{2x}$ soi	**(B1)**	
	$\frac{\mathrm{d}y}{\mathrm{d}x} = \frac{k\mathrm{e}^{2x} - 2kx\mathrm{e}^{2x}}{\left(\mathrm{e}^{2x}\right)^2}$ oe, isw	**(B1)**	**FT** for use of quotient rule $\frac{k.\mathrm{e}^{2x} - kx.\left(their\ 2\mathrm{e}^{2x}\right)}{\left(\mathrm{e}^{2x}\right)^2}$